

Chapter 3. Planning Tools for Flood Hazard Areas

Comprehensive planning, zoning, and subdivision control are a local government's primary land-use planning tools. They can serve as a foundation for the community to address floodplain development issues. Floodplain regulations, which are a community's zoning ordinances, subdivision regulations, building and health codes, and special purpose ordinances (e.g., floodplain, erosion, and drainage ordinances), build on that foundation by providing standards that prevent and reduce flood damage.

This chapter describes how land-use planning, conservation, and growth management techniques can be put to work to meet the goal of reducing flood losses and protecting the natural functions of floodplains. The techniques described here range from conventional

comprehensive planning and land development controls to innovative techniques that employ cluster development arrangements, open space preservation, and performance-based setbacks.

LOCAL COMPREHENSIVE PLANNING

The comprehensive plan (sometimes called a general plan, land development plan, or master plan) is a collection of policies on how the community will grow, change, and look in the future. The plan document is the result of a planning process that involves many city departments, business people, landowners, developers, and citizens. Out of the process emerge policies that reflect local values and concerns. These policies are implemented through land development controls,



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In this example, the wide floodplain is devoted to wetlands, parks, and street frontage while homes are kept on natural high ground outside the floodplain.

which include a zoning or land development ordinance, subdivision regulations, and other special regulations.

Comprehensive plans are typically formatted to include discreet elements that deal with land use, transportation, housing, community facilities, economic development, education, historic preservation, the environment, and other issues. A community with known or potential flood risks and undeveloped land in the floodplain may use the comprehensive planning process to evaluate policies related to floodplain development and reducing flood losses. For example, a community might opt to:

- keep those lands undeveloped;
- use public monies to acquire and convert the lands to recreational uses such as parks or a greenway;
- permit some low-density development; or
- allow some combination of the latter two options.

Floodplain management policies may be included in the plan's environment element, with appropriate cross references to other elements that have an impact on the floodplain, such as land use and community facilities. For example, a community facilities element would identify where major investments in roads, parks, and utilities will be made over the period established in the plan. If the community policy is to avoid development in the floodplain, the community facilities element should indicate that major investments in new roads and

utilities will not be made in those areas. Parks and open space needs are also commonly addressed in this element. If, through the planning process, the community had decided to acquire or convert portions of the floodplain to recreational use or open space, that too would be stipulated in the community facilities element.

A community's facilities element of a comprehensive plan is not the same as a capital improvements program (CIP). A CIP contains specific schedules and funding sources for improvements to be undertaken in five-year time frames. A CIP is often the implementing mechanism for a community facilities element, but many communities have an ongoing CIP process that is not linked to an up-to-date comprehensive plan. A stand-alone CIP is also based on policy decisions and should reflect the community's desire to avoid floodplain development if such a desire exists.

Throughout the twentieth century, the chief purpose of planning was to produce a document on which future land-use decisions would be based. In the last 10 to 15 years, planners have emphasized the importance of the planning *process* more so than the resultant document. Today, many planners view plans as "living" documents, a continuously evolving set of policies and ideas that are permanently open to analysis, evaluation, and modification. This latter approach suits floodplain planning very well. Environmental conditions change as land in or near floodplains is developed or modified, and plans must be amended to reflect those changes.

Figure 3-1. The Federal Interagency Floodplain Management Task Force Recommended Seven-Step Planning Program

1. Identify the planning area

This area may include an entire watershed or a portion of a floodplain within a community. Generally it will include all the land area from which floodplain problems may arise.

2. Conduct an inventory and analysis of land-use and environmental concerns

This will include a natural and cultural resources inventory, an assessment of existing conditions and development, and an environmental analysis.

3. Conduct a problems and needs assessment

This step will serve to identify problems and needs of streams, floodplains, and the watershed, if applicable. Problems typically identified in this step would be: removal of vegetation; erosion; nonpoint source pollution; and loss of habitat. The impacts of such actions would be described and mapped in the plan.

4. Define the corridor management boundary

The boundary of the corridor defines the area that will be subject to policies in the plan and resulting

regulations. This boundary would typically include the 100-year floodplain plus adjacent woodlands, wetlands, and other lands that may have an impact on the functions and resources of the floodplain.

5. Develop an action plan/agenda

This step would include developing goals and objectives for protection of the floodplain, creating an agenda, and determining the sequence of events. In this step, the plan would outline broad goals of floodplain preservation, restoration of resources, and recommendations about the amount and extent of future development. (See Chapter 2 of this report for a description of tools for protecting and managing the floodplain.)

6. Implementation and monitoring of the action plan

This step requires the primary entity for implementing the action agenda to establish a monitoring system for tracking success in meeting plan goals. This requires regular examination of conditions in the planning area and involvement by key stakeholders in the planning process and on the ground.

Source: *Protecting Floodplain Resources: A Guidebook for Communities*, June 1996, 17-26.

In most states, comprehensive plans are advisory only and local governments are not required to have a plan in order to enact land development controls. This is slowly changing as many states (Florida, Georgia, Oregon, and Washington to name a few) have moved in the last several decades to revise their planning laws. These states now require or strongly encourage local governments to prepare a comprehensive plan and land development regulations that are consistent with statewide goals and guidelines.

FLOODPLAIN MANAGEMENT PLANNING

It is highly desirable for a local government to have a plan upon which to base floodplain regulations. When landowners are being asked or required to limit or modify activities in floodplains, they deserve and have the right to participate in the process that establishes these limitations. Regulations that are based on policies developed in a community-based planning process that analyzes growth and development options are much more easily enforced by local government and accepted by property owners than regulations that are written by local officials with little public input.

As described above, policies regarding development in floodplains may come about through the broad comprehensive planning process. But communities are increasingly undertaking a planning process that focuses specifically on floodplain issues. Part of the reason for this is that the National Flood Insurance Program (NFIP) strongly recommends it, and credit is given to participants of the Community Rating System (CRS) for communities that do so. (See Chapter 1 for a description of both NFIP and CRS.) There are also many regions now doing watershed planning, in which communities within a common watershed come together to formulate goals for protection of watershed functions.

To aid communities that are undertaking planning efforts to protect floodplains, NFIP and the Federal Interagency Floodplain Management Task Force have each produced guidance materials on how to conduct a planning process. The Task Force's seven-step approach emphasizes a "highly participatory approach for planning resource protection in the floodplain" that involves various stakeholders, including landowners, resource managers, local government, environmentalists, and agriculture and business interests. Details of the recommended process are shown in Figure 3-1.

In addition, local governments that participate in CRS are eligible for premium reductions on flood insurance if their community undertakes a wide range of floodplain management activities, one of which is planning. (Other activities for which a community can receive CRS credit are described throughout this chapter.) CRS credit is provided for preparing, adopting, implementing, evaluating, and updating a comprehensive floodplain management plan. CRS guidance materials describe a 10-step planning process that must be undertaken to receive credit. The most important steps (e.g., the ones for which a community receives the most credit points) are involving the public, coordinating with other agencies, assessing the flooding

problem, and developing an action plan (NFIP/CRS Coordinator's Manual 1996).

ZONING AND SUBDIVISION REGULATIONS

Zoning and subdivision regulations are the chief tools for implementing a comprehensive land-use plan. The ultimate source of authority for zoning and subdivision regulations is the police power—the power of local government to regulate for the health, safety, and welfare of the citizenry. In communities that do not have a plan, the zoning ordinance and zoning map serve as a land-use plan (although APA recommends preparing a plan prior to enacting a zoning ordinance).

Zoning ordinances divide the community into districts and impose land-use regulations on each district. The four traditional use designations are residential, commercial, industrial, and agricultural. Each district has standards specifying the permitted uses of land and buildings, the density of such uses, and the size and bulk of buildings. Zoning ordinances in small towns and rural counties may have four districts—one for each use classification—while larger cities and jurisdictions have many districts for each use category.

There are a couple of ways a community may organize its land development regulations where floodplains are concerned. Most communities adopt a "stand-alone" floodplain ordinance that incorporates NFIP standards. This ordinance identifies flood hazard areas and imposes specific requirements to prevent or reduce flooding. It establishes a type of overlay district, the requirements of which supplement basic zoning, subdivision, and building code requirements.

The other option is to incorporate floodplain development standards (and NFIP standards) directly into building codes and subdivision and zoning ordinances. These "tools" serve several purposes. Building codes impose construction standards on those buildings that are allowed to be built in the floodplain or that may be otherwise subject to flood damage. Zoning and subdivision regulations complement the construction standards by guiding development out of floodplains into more suitable areas and thereby limiting the impact of development on the floodplain's natural functions.

Some zoning ordinances contain a specific "floodplain" or "flood hazard zone" with a discreet list of permitted land uses and standards that apply to the placement, siting, density, and other issues related to development. The boundaries of these zones typically coincide with the 100-year floodplain as delineated on FEMA flood insurance rate maps (FIRMs). Ordinance provisions for floodplain zones would include a list of permitted land uses and establish standards to ensure that any development would be compatible with the goal to reduce or minimize flood damage potential.

Subdivision of land is the process by which a tract of land (usually on the urban fringe) is divided into smaller parcels, lots, or building sites so that the sites may eventually be sold, developed, or both. Most states give the local planning commission or legislative body broad general power to regulate certain aspects of subdivision development. Provisions typically address

Figure 3-2. Using NFIP Standards in Local Ordinances

Communities participating in NFIP must decide whether to place NFIP standards in a floodplain management ordinance (with appropriate references to the standards in the zoning and subdivision ordinance) or incorporate the standards directly into zoning and subdivision ordinances. Below are subdivision provisions from the Floodplain Management chapter of the Marin County, California, code (Chapter 23.09) that satisfy NFIP minimum subdivision requirements.

- (A) All preliminary subdivision proposals shall identify the flood hazard area and the elevation of the base flood.
- (B) All final subdivision plans will provide the elevation of proposed structures and pads. If the site is filled above the base flood, the final pad elevation shall be certified by a registered civil engineer or licensed land surveyor and provided to the floodplain administrator.
- (C) All subdivision proposals shall be consistent with the need to minimize flood damage.
- (D) All subdivision proposals shall have all utilities and facilities under the control of the county located and constructed to minimize flood damage.
- (E) All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage.

the regulation of street layout; the installation of utilities; lot size, shape, and setbacks; curbs, sidewalks, and gutters; open space; and public improvements. Most states also give local governing bodies the power to require other types of improvements or protections for certain lands within subdivisions. These may include soil erosion controls, aesthetic controls, preservation of farmland, and flood control measures.

Subdivision ordinances that are drafted with the purpose of reducing or minimizing flooding susceptibility usually require each lot to have a buildable area on natural high ground. These ordinances also set construction and location standards for the infrastructure built by the developer, including roads, sidewalks, utility lines, storm sewers, stormwater retention and detention basins, and drainageways (ASFP 1996, 15). Commonly, a subdivision ordinance will include abridged descriptions of NFIP minimum standards for subdivisions. (See Figure 3-2.) Subdivision regulations, particularly those adopted in the last decade, also contain provisions for drainage, stormwater management, and erosion and

sedimentation control. As with floodplain provisions, these regulations are either adopted separately or included in the subdivision ordinance.

OTHER LAND-USE PLANNING TOOLS

Comprehensive planning, zoning, and subdivision control are the bread and butter of land-use planning. But there are a wide range of additional land planning and conservation techniques that can achieve the objectives of preventing and reducing damages to subdivisions in or near floodplains.

The techniques described below would be part of a local government framework that encourages better design of subdivisions in flood hazard areas. These tools can be seen as policy fundamentals—the local government incorporates these concepts into plans and ordinances to show that it is open to alternative and innovative development patterns that will protect floodplains. In addition to the floodplain management planning activities described above, local governments that participate in CRS are eligible to receive CRS credits for some of the activities described below. Property owners who hold NFIP flood insurance are eligible for premium reductions if their community undertakes certain activities under CRS.

Cluster Development (Open Space Subdivision Design)

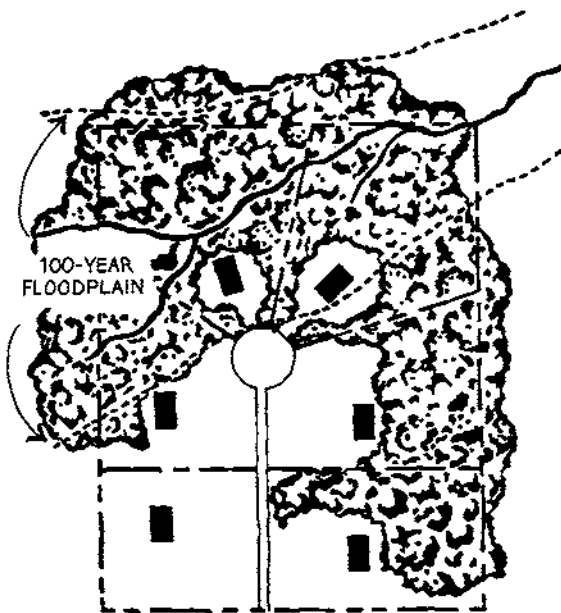
Cluster development (more recently called open space subdivision design or open space zoning) is most often associated with the preservation of farmland and woodlands and the protection of rural character. Many planners use the terms cluster development and open space zoning interchangeably, but, according to some, open space zoning is used to establish greater requirements on the size and quality of the open space protected (Arendt 1991; NAHB 1991).

Cluster development is also a commonly touted method for reducing the cost of housing by reducing the public investment needed for land clearance, site preparation, and infrastructure. This type of development allows the same gross density or overall amount of development that is already permitted in the zoning ordinance, but construction is typically limited to one-half of the parcel. The remaining open space is reserved for common use. That open space is permanently protected under a conservation easement and is usually maintained by a homeowners association.

Conventional zoning inadvertently but directly discourages cluster development. Traditional zoning emphasizes separating incompatible uses and establishing development standards like maximum densities and minimum setbacks. Traditional zoning has resulted in subdivisions with houses, streets, and yards, but very little open space. In order for developers to depart from the norm, the regulatory means to do so must be available, and the developer's options must be made clear.

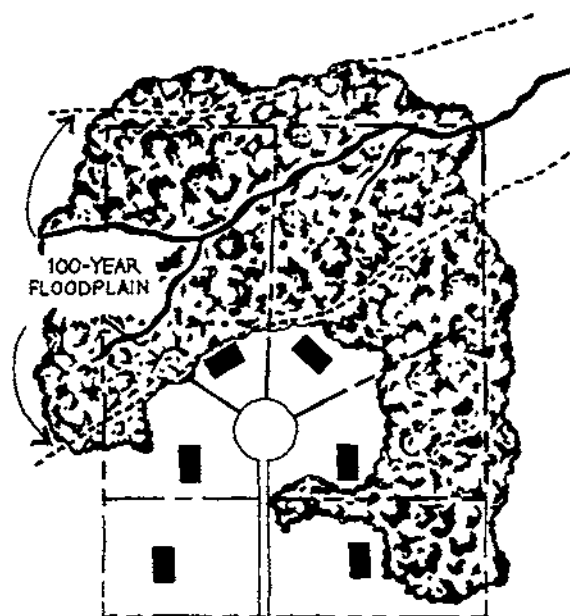
Certain provisions in subdivision regulations, such as limits on impervious surfaces, requirements that set minimum buildable area for each lot, as well as drainage control regulations that prohibit an increase of runoff from a site after it is developed, all work in

Figure 3-3. Conventional and Cluster Development Scenarios



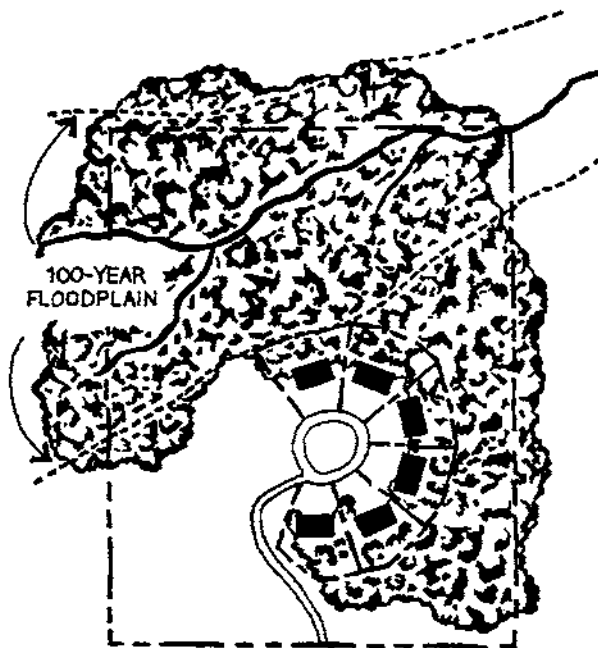
CONVENTIONAL PLAN A

Conventional Plan A: All land on site is subdivided into lots; some lots partially or entirely in floodplain; some homesites in floodplain.



CONVENTIONAL PLAN B

Conventional Plan B: All land on site is subdivided into lots; some lots partially in floodplain; homesites restricted to natural high ground; setbacks and sideyard restrictions modified to accommodate structures out of floodplain.



CLUSTER PLAN

Cluster Plan: All floodplain lands and other sensitive lands kept as open space; net density remains equal to conventional plans; lot sizes reduced to protect natural features; all homesites are on natural high ground.

Note: These scenarios also help illustrate the design hierarchy presented in Chapter 4.

Figure 3-4. Optional vs. Mandatory Clustering

Many states (e.g., Florida, Illinois, Indiana, Ohio, New Hampshire, New Jersey, Pennsylvania, Vermont, and Washington) provide for cluster zoning in their planning and subdivision enabling legislation. Most of these states allow local governments to offer it as an option to developers. A few states (e.g., New York) give the local planning board the power to *require* developers to submit a proposed cluster plat.

Mandatory provisions can be used on a case-by-case basis for proposed developments that would destroy or remove more than a specified percentage of whatever land the community seeks to protect, including floodplains. For example, a number of towns in Massachusetts have adopted a Farmland/Open Space Conservation and Development bylaw that encourages flexible subdivision layouts and prohibits new development of farmland from consuming more than 50 percent of the parcel. Arendt (1994) advocates that developers be required to submit two sketch plans—one depicting gross density in a conventional site layout and one depicting gross density in a cluster pattern. He believes that, given a graphic illustration of the two options side by side, property owners and the planning and zoning board will recognize the land conservation value of the cluster option.

General provisions for cluster subdivisions are usually found in a supplementary section of a zoning ordinance. These provisions typically include the following items:

- A statement of purpose
- A provision permitting transfer of densities within the subdivision
- Review criteria
- Identification of districts where the cluster option is allowed
- Minimum size requirements
- Open space requirements

conjunction to steer development into a cluster configuration. In a floodplain, the cluster concept is usually applied so that the homes are grouped on the natural high ground area of the site or on a small, contiguous, filled area with the remainder left as open space or recreational land. NFIP communities that participate in CRS can receive credits for keeping open space free from development. The open lands may be publicly or privately owned as a park, golf course, private grounds, or similar use. Additional credit can be received if deed restrictions are placed on the property to prevent future owners from developing the lands and if the open space is left in an undisturbed natural state.

The cluster method has long been advocated by planners and has become increasingly common in the last several decades, particularly in the Northeast. Because it usually allows a developer to achieve the same gross density as conventional development would allow, clustering has emerged as a common tool for subdivisions and planned unit development sites that contain any sort of sensitive and government-regulated environmental features.

There is a perception in some areas that cluster development is simply a euphemism for high-density, multifamily development. The fact is that open space zoning or cluster development is also a means for developing single-family homes on separate lots to obtain open space and recreational amenities. There are common fears that the open space in the cluster subdivisions will be developed in the future. The latter concern is unfounded because cluster ordinances usually stipulate that further subdivision of the open space that is part of the initial development is prohibited.

Even in communities that allow cluster development as an option, these “nonconventional” developments are subject to more rigorous review than conventional developments. Knowing that these developments will be scrutinized more closely has been identified as a deterrent to pursuing cluster as an option among developers (Arendt 1991; Arendt 1994).

Concerns of property owners about cluster development (e.g., privacy, density, housing types, future uses of the open space) can be addressed effectively in an ordinance. Most ordinances require the developer to stipulate who is responsible for managing and maintaining the open space. Homeowners associations are often used to manage common recreational lands. See Appendix E for examples of a cluster development ordinance.

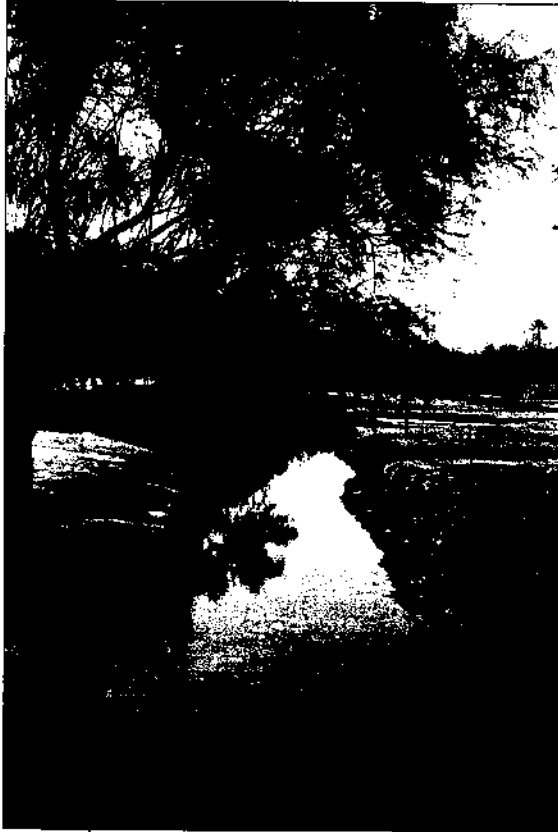
Density Transfers, Credits, and Bonuses

Integrally related to the cluster concept is the notion of density transfer. Developers can be permitted to transfer density from one part of the site to another as a means of encouraging cluster development or to meet minimum buildable area requirements. A straight transfer of density would not necessarily increase the total number of dwelling units allowed (the gross density); it would simply concentrate the development on the least sensitive portions of a site.

Some communities provide density bonuses for developers who choose a cluster pattern over a conventional layout. Density bonus systems generally allow the gross density of a site to be increased in exchange for a preferable site plan, such as a cluster development, in which all building sites are out of

the floodplain. Bonus provisions are used to achieve a number of other purposes as well, most often affordable housing. Density bonuses are most effective in areas where the permitted density is very low and greater increases can be allowed without compromising the lands that are being set aside (Arendt 1994).

credit for portions of a subdivision that cannot be developed because they are classified (according to the ordinance's definition) as a sensitive area or buffer, which includes floodplains. Whatever development is allowed is sited on land that is not environmentally restricted. The credits are calculated on a sliding scale, ranging from a 100 percent density credit in cases where



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The Indian Bend Wash in Scottsdale, Arizona, is a four-mile-long greenway designed to handle a 100-year flood as a means of protecting adjacent residential neighborhoods from flooding. The wash provides open space, grass, golf courses, ball fields, hiking and bicycle trails, and picnic areas. The wash was completed in 1979 and is a joint project of the U.S. Army Corps of Engineers, the Maricopa County Flood Control District, and the City of Scottsdale.



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In Washington County, Oregon, a developer who uses the cluster option can build to one unit per eight acres, whereas the density limit for conventional subdivisions is one unit per 10 acres. Clark County, Washington, allows clustered subdivisions to be developed at one unit per five acres, plus an additional two dwellings for every 20 acres in the project; conventional developments are limited to one unit per 20 acres (Salkin 1991).

King County, Washington, through its Sensitive Areas Ordinance, offers developers partial density

10 percent of the property is in the floodplain to a 20 percent credit in cases where 90 percent of the property is in the floodplain.

Fairfax County, Virginia, applies a special density limit to parcels in which 30 percent or more of a parcel is in the floodplain. In such cases, 50 percent of the maximum permitted density is calculated for that area of the parcel which exceeds 30 percent of the total area of the parcel. For example, if 45 percent (45 acres) of a 100-acre parcel's land area is in a floodplain and the

maximum allowable density is four units per acre, the allowable density for 15 percent (15 acres) of the parcel would be just two units per acre. These subdivisions are further subject to open space and setback requirements, both of which are mentioned below.

Planned Unit Development

A Planned Unit Development (PUD) is a land development project that is comprehensively planned as a single entity via a site plan. It permits mixtures of housing types and land uses, flexibility in building siting, usable open spaces, and the preservation of natural features. PUDs emerged in the 1960s as an alternative to typical zoning and subdivision controls that, in some cases, were seen as inadequate in regulating large development, containing a mix of uses or housing types.

The increased use of PUDs in the 1970s was also a reflection of a greater sensitivity to the environment. Most conventional subdivision development involves clearing a site of all ground cover and vegetation, and placing lots on nearly every portion. PUDs, like cluster development, allow for density transfers from the environmentally sensitive parts of the site to the buildable parts. Many large PUDs now feature wetlands, lakes, wooded stream corridors, and stormwater retention basins as amenities.

Local governments generally have adopted provisions for PUDs in their zoning ordinances. There is often a threshold of acres over which the developer is either required to go through the PUD process or is given the option of going the PUD route.

There are a number of common provisions in PUD ordinances. For example, most start with a statement of purpose that contains broad generalizations about the value of good design and increased amenities, and the importance of protecting the environment and wildlife habitats. This statement is followed by a list of permitted uses in the PUD. Minnetrista, Minnesota, for example, lists the following.

Sec. 23-178. Permitted Uses

Within a PUD, no land or building shall be used except for one of the following uses:

1. Those uses listed as permitted or conditional uses in the districts in which the development is proposed [For residential PUDs, this would include the range of allowable housing types—single-family detached, townhouses, multifamily etc.];
2. Educational, religious, cultural, recreational, or commercial facilities that are designed or intended to serve the resident of the PUD;
3. Uses appropriate to other zoning districts shall not occupy more than 15 percent of the PUD land area;
4. PUDs allowing density increases shall not be allowed in areas where municipal sanitary sewer facilities are not available except where the [city] Council finds it in the interest of the community to protect and preserve unique physical features of the property, including wetlands, steep slopes, woodlands, or other physical land features.

PUD regulations also contain provisions for allowable density and density bonuses. Some PUD

ordinances, like cluster ordinances, do not permit the density to exceed what is allowed for the site under conventional zoning. (Point 4 in the Minnetrista example above is an exception.)

And there are requirements for open space. There are several schools of thought about what percentage of the gross site area should be set aside as common open space and about what can be counted as open space. In a few recent ordinances, unbuildable parts of the PUD are excluded from being considered common open space. These areas include wetlands, beaches and dunes, very steep slopes, and the floodway portion of flood hazard areas (Reed 1992). The zoning ordinance for Cherry Hill Township, New Jersey, for example, states that "In no event shall floodplain areas or any other ground that cannot be built upon because of ordinance or statute [restrictions] be counted as open space land for the purposes of complying with this section [of the ordinance]."

Other communities view the open space requirement as a means by which sensitive lands can be set aside from development and therefore *allow* them to count towards the requirement. Ordinances in communities that allow unbuildable portions to count as open space vary as to whether water surfaces can count toward that requirement. In general, jurisdictions that allow developers to count unbuildable land as open space will allow water surfaces to satisfy 20 to 30 percent of the total open space requirement (Reed 1992).

Finally, PUD ordinances include development standards and parking and landscaping standards. Local policy makers vary widely in how detailed they make these provisions. They must balance the issue of whether to make the standards very specific, which could squelch the opportunities for innovative design, or too vague, which might give the developer the impression that "anything goes" in that community. To balance these concerns, many communities have development standards for building height, setbacks, lot coverage, and the location of parking, with the understanding that some variations on these standards may be appropriate and that exact specifications for the development will arise from the negotiating process.

The review and approval process for PUDs is essentially the same as the typical subdivision review procedure. But, because PUD standards and specifications are developed on a case-by-case basis, the process of negotiation between the developer and local officials can go on far longer than it does for a conventional subdivision review. It is a fact of life that, at present, developers who are willing to be innovative with development design—such as with cluster developments—are subject to greater scrutiny in the review process than are those that are proposing cookie-cutter subdivisions that do not necessarily respect the natural features of the site.

Open Space Requirements in Subdivisions

All subdivision ordinances contain minimum requirements for common open space above what is called for in yards and buffers. Communities use a variety of methods to calculate how much open space the developer is required to dedicate. The most

common method is to base the required open space acreage on projected population—generally ranging from one to 10 acres per 1,000 residents (Listokin and Walker 1989). Other communities use a percentage of total subdivision acreage or the number of dwelling units to determine open space requirements.

Modern ordinances differentiate between developed and undeveloped open space, and specify the amount of land that should be left in its natural state. Poulsbo, Washington, for example, encourages the retention of natural areas by allowing up to 30 percent of the total land donation area to consist of wetlands, slopes, floodplains, or other natural features, while the remaining 70 percent of the dedicated land must be suitable for recreational activities.

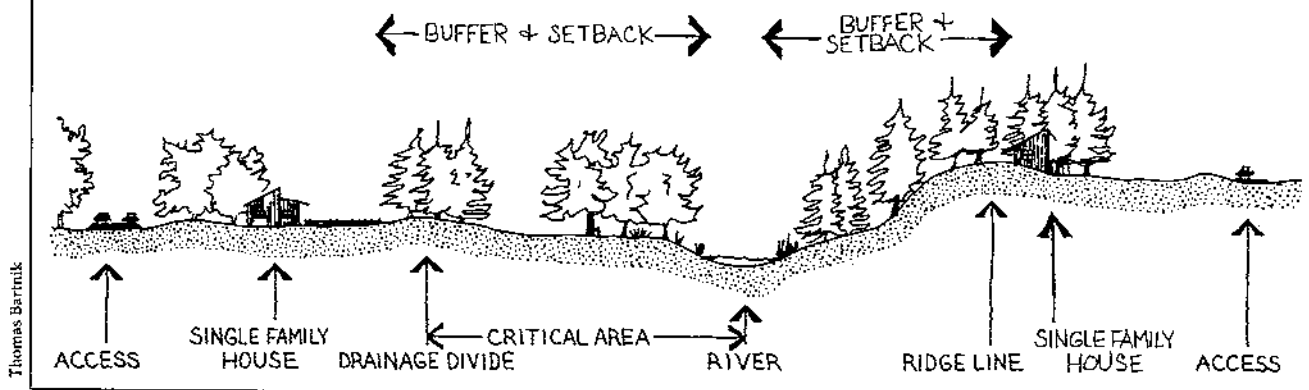
Drainage and floodplain regulations may provide additional open space on a site or in a subdivision beyond what is normally required. Drainage ordinances that require detention and retention ponds and place a limit on the amount of impervious surface on a site can result in more open space overall in the development. In floodplains, there are allowances for transferring

open space established along a natural corridor, such as a riverfront, stream valley, or ridgeline, or overland along a railroad right-of-way, canal, scenic road, or other route that has been converted to recreational use (Little 1990). Some communities are requiring the dedication of greenway easements along floodplains, minor streams, and other linear features. The greenway counts toward the open space requirement for a subdivision.

The Winston-Salem/Forsyth County, North Carolina, Vision 2005 plan recommends that all designated floodplains in the county be set aside as greenways. The county subdivision ordinance requires a 40-foot minimum greenway easement for all development along floodplains. The state of North Carolina provides tax credits for land donations for greenways and other conservation purposes.

In the lexicon of zoning and land-use controls, buffer areas are landscaped or wooded strips that separate incompatible uses. Zoning and landscape ordinances contain standards for buffers that are specific to each use and to every district. Ordinance provisions typically

Figure 3-5. Typical Riverine Buffers and Setbacks



River and stream protection programs often establish buffer zones within which trees or other vegetation are to be left undisturbed. Setbacks demark a point beyond which development cannot encroach upon the floodplain. Buffers and setbacks are methods to minimize the impacts of adjacent development on the floodplain and on water quality.

density and clustering units that provide an automatic increase in open space. Fairfax County, Virginia, for example, requires the open space in cluster developments to have at least one acre of usable open space outside the floodplain and have no dimension that is less than 50 feet. As noted in the cluster development section, NFIP communities that also participate in the CRS can help property owners reduce flood insurance premiums by leaving land and open space, and additional credit is given where lands have been left undisturbed or have been restored to protect the natural and beneficial floodplain functions.

Greenways, Buffers, and Setbacks

Greenways have emerged as a tool for linking subdivision requirements with recreational and floodplain management goals. A greenway is a linear

dictate the buffer width and type of material to be planted or the allowable height of fences or berms.

Setbacks are established in a zoning ordinance to delineate the required distance between a building and each lot line. Together, the front, side, and rear setbacks make up the yards of the principal building on each lot. The setback concept can be further applied in floodplain or sensitive lands ordinances to separate urban development from wetlands, coastal areas, riverbanks, or floodplains. These setbacks, rather than just establishing yards, are used to reduce the impact of development on any of the environmental features that may be present on a site.

River and stream protection programs frequently establish some form of buffer zone and setback along the banks of the waterway. The purpose is to ameliorate the negative effects that adjacent development may

Figure 3-6. Sustainable Development and Floodplain Regulations

There has emerged an awareness among floodplain managers, planners, environmentalists, and local officials about the benefits of protecting the natural functions of floodplains as a means of protecting property from flood losses and preserving natural ecosystems. This approach can be viewed as part of a broader movement toward sustainable community development.

Sustainable development, loosely defined, means development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. Many countries, including the U.S., as well as state, regional, and local governments and environmental and nonprofit organizations, have embraced this new paradigm and are currently evaluating growth, development, economic policies with the goal of ensuring sustainability.

Major tenets of sustainability include: recognition of the interconnectedness of environmental, economic, and social actions; a balance of present needs with future needs; recognition of natural and geographic boundaries rather than artificial or political boundaries within which to make decisions; and an inclusive and participatory rather than autocratic planning and decision-making process.

In a March 1995 report to Congress on A Unified National Program for Floodplain Management, President Clinton stated that floodplain management efforts by all levels of government should pursue "a

more comprehensive, coordinated approach to protecting and managing human and natural systems to ensure sustainable development relative to long-term economic and ecological health."

The core issue that arises when planning for floodplain use—balancing community growth and economic development with natural resource protection—is therefore central to the sustainable development concept. To that end, a floodplain planning effort may use sustainability principles as a framework within which goals can be established.

The aim would be to devise a policy that allows use of the floodplain in a manner that supports existing community needs without jeopardizing future residents' ability to benefit from its resources and natural flood control functions. And conversely, a community that chooses to undertake a sustainability development planning initiative would by all means have to consider its policies for development in or near floodplains and the extent to which existing plans and regulations were meeting sustainability goals.

For more information, see *A Planners Guide to Sustainable Development* (APA PAS Report No. 467, December 1996). The report describes the paradigm shift in the planning field toward sustainable development. It also highlights local sustainability initiatives from Cambridge, Massachusetts; Chattanooga, Tennessee; Olympia, Washington; Santa Monica, California; and Seattle, Washington.

have on the floodplain or waterway. A buffer zone is a 25- to 100-foot strip in which the clearing of forest, shrubs, or other ground cover is prohibited. This strip of vegetation helps protect the bank from erosion, filters sediment from surface runoff, and helps to maintain the scenic character of the waterway (Warbach 1991). The use of buffers in filtering pollutants and reducing runoff is described in greater detail in Chapter 4.

Overlay Districts

An overlay district is a special zone district that superimposes additional specific development controls onto existing zoning requirements. Environmental overlay districts are probably the most common type. Some local governments, in enacting an overlay, group all environmentally sensitive lands—such as floodplains, steep slopes, watershed and aquifer recharge areas, wetlands, and coastal areas—into an umbrella overlay district. Different development standards and requirements are then applied to the various lands, depending on the objectives of the ordinance (i.e., preserving the natural functions of wetlands, protecting property from flooding, prevention of mudslides and erosion). Other local governments may choose to enact separate overlays to deal with each type of sensitive area. Floodplain ordinances, as described above, are often applied as an overlay zone. If streamlining land development permitting is a goal for a local government, an umbrella

sensitive environmental land overlay will help avoid redundancy in the development review process.

Performance Zoning

A performance-based approach to zoning offers developers flexibility in subdivision design that allows them to maximize the development potential of a site without compromising the site's natural features. This approach eschews conventional zoning district designations and replaces them with standards that are based on the impact any given land use will have on the environment and its surroundings. The technique was first used in Bucks County, Pennsylvania, in the early 1970s as a method of ensuring environmental protection while encouraging a range of housing types.

There are a number of communities that have adopted comprehensive performance-based codes. These include Hardin County, Kentucky; Ashland, Oregon; Largo, Florida; and Queen Anne County, Maryland. And many other zoning ordinances or land development codes contain some limited performance-based requirements, particularly to be used in protecting sensitive areas, buffering incompatible uses, or mitigating industrial development externalities, such as dust and noise.

Performance zoning regulates the intensity of development on the basis of four ratios: open space ratio, impervious surface ratio, density, and floor area ratio, rather than relying on rigid lot size, setback, and housing type regulations.

In Bucks County, the amount of development allowed on any site is limited by the site's specific mix of natural features. (See Figure 3-7.) No filling or encroachment is permitted on floodplains or alluvial soils, or in streams, lakes, ponds, or wetlands. Historically, the county has had serious flooding problems. In light of this, county planners necessarily emphasize maintaining natural drainage systems in new developments. Further, only about 20 percent of the villages in the county are served by public sewers. The remaining properties are serviced by on-site wastewater disposal systems which, when faulty, can pose serious risks to groundwater quality. And due to the relatively high-density development that exists in the villages, on-site disposal can be compromised when the distance between absorption areas is not sufficient to permit adequate treatment or dilution of pollutants.

In addition to the floodplains, parts of the county are broad, flat natural retention areas that do not drain well because of soil conditions and topography. The county requires that 90 percent of every subdivision site in a natural retention area be kept as open space.

Limits are also set for development in other sensitive areas. On the basis of environmental standards, each site where development is proposed is evaluated, and a portion of it is designated as undevelopable.

Transferable Development Rights (TDRs)

TDR systems are used to shift development from lands and properties determined to be in need of protection toward more desirable locations within a jurisdiction. TDRs have been used to protect farmland, to prevent demolition of historic buildings, to increase development densities in targeted areas, and to protect environmentally sensitive lands, including floodplains. A TDR program takes some of the bundle of development rights from one piece of property (the sending site) and transfers or relocates it to another piece of property (the receiving site). Sending sites may be defined categorically (e.g., every farmland parcel over a certain acreage and each parcel containing high-quality wetlands) or geographically (every parcel within a designated district). Receiving areas may be determined on a case-by-case basis or a receiving zone or district may be established. (See the Amicus Curiae Brief of the National Trust for Historic Preservation et al. in support of the Tahoe Regional Planning Agency in *Suitum v. TRPA*).

TDR programs have been applied in more than 40 jurisdictions in 13 states in the last 20 years. Lee and Collier Counties, Florida, and in the Pine Barrens regions of New Jersey and Long Island, New York, have used TDRs to protect environmentally sensitive lands, particularly coastal wetlands and floodplains and mangrove swamps. Lee County is using its TDR program to redirect development from some poorly sited (and still undeveloped) subdivisions in coastal wetlands.

TDR systems have been difficult to administer in some jurisdictions because they require a high level of cooperation from neighboring property owners of the receiving site (the place where the density is transferred to). There also has to be a high level of demand for development in both the sending and receiving site. In

some cases, programs have been put in place but have not succeeded because developers were satisfied with the limited development density that was allowed in the sending area, and the additional allowable density in the receiving area was not a big enough incentive to result in the relocation of development from the sending site.

Low-Density Zoning

Zoning that permits development densities of one to five dwelling units per acre (generally referred to as large-lot zoning) is one of the most often-used land-use

Figure 3-7. Bucks County, Pennsylvania, Environmental Protection Standards

Type of Area	Percent of Development Allowed
Floodplain and alluvial soils	0%
Lakes and ponds	0
Wetlands, swamps, and bogs	0
Natural retention areas	10
Steep slopes: 25% or greater	15
Steep slopes: 15–25%	30
Steep slopes: 8–15%	40
Forests	20–40
Ponds and lakeshores	20–30
Agricultural areas	5–40

tools to protect floodplains. Low-density zoning in floodplains and adjacent to rivers and streams can be helpful in minimizing impervious surfaces and reducing the number of buildings at risk. The CRS program offers credit to communities that create minimum lot sizes of 1 to 10 acres or more per dwelling unit.

But overreliance on low-density zoning can be detrimental in the long run because it encourages inefficient sprawling development patterns. Sprawl results in a greater overall amount of land area devoted to urban uses (e.g., roads, buildings, parking lots), which can have greater negative environmental impacts on floodplains than well-planned higher-density development. Furthermore, zoning codes that mandate large residential lots do not necessarily pay proper attention to drainage and erosion control on individual sites. Low-density zoning along waterways also reduces opportunities for people to use and enjoy the water in that it removes or limits public access. To work effectively, low-density zoning should not be the primary land-use tool aimed at reducing or minimizing flood damage; it should be used in combination with other regulations, such as site plan review, to help minimize the impact of the development on the natural features of the site. APA and FEMA encourage communities to look beyond low-density zoning for other methods to protect floodplains.